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LUMINARY Memo #170

TO: Distribution

FROM: B. McCoy

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SUBJECT: Level 6 Testing for Apollo 14

Level 6 Testing for Apollo 14 will be essentially that which was done for Apollo 13 with Astronaut cards more closely reflecting the actual Astronaut procedures. Three special tests will be added; they are the LM RCS Deorbit Burn, the TPI APS Impulsive Burn, and Docked-DPS Burns. Level 6 Testing is contingent on receiving a Data Package (complete with E memory load), the Operational Trajectory, and the Apollo 14 Terrain Profile & LM Time Line. One sigma errors will be included in State Vectors, INU, Radar and Terrain Profile (1^{o} error slope error, also). Instead of the Concentric Rendezvous Profile of Apollo 13, the Short Rendezvous will be used.

DAP inserts will be used for DAP editing purposes. The RTCC Program Verification Testing will begin when the tests and initial conditions are specified by NASA (not for Rendezvous or Surface Alignments).

Attached is the tenative Level 6 Test Plan. A more complete plan will be published later. It will be subject to change if the mission profile changes.

If time before the SFRR is sufficient when these Level 6 tests have been completed, some tests will be run to verify contingency procedures, e.g. RCS TPI burn.

Test	Description
6.1.0	Rendezvous
6.1.1	Short Rendezvous - program sequence: P00, P20, P34 P42, P35, P41, P35, P41.
	Initial Conditions: (1) 1σ IMU, Radar, state vector errors (2) normal astronaut interface from Apollo 14 Data File (3) Apollo 14 O. T., Data Package (4) 10% TLOSS during Average G
6.2.0	Aborts from Descent
6.2.1	Abort at 30k ft - program sequence: P00, P63, P70, P20, P34
6.2.2	Abort at 7 k ft, Abort Stage at DPS depletion - program sequence: P00, P63, P64, P70, P71, P20, P34
6.2.3	Abort Stage after Touchdown - program sequence: P63, P64, P66, P71, P20, P34
	Initial Conditions: (1) 1σ IMU, Radar, state vector, terrain profile errors (2) normal astronaut interface from Apollo 14 Data File (3) Apollo 14 O. T., Data Package (4) 6.2.1 with 10% TLOSS until Orbit Insertion (5) Yaw LM 40^{o} after the pitch maneuver
6.3.0	Lunar Surface Operations and Ascent
6.3.1	Lunar Surface Alignments - program sequence: P68, P00, P12, P57 (star/planet), P06, P57 (gravity/star), P57 (gravity/REFSMMAT), P12 to TIG.
	Initial Conditions: (1) offset RLS to show effect of gravity vector updates to RLS. (2) Initialize LM attitude to 5^{o} pitch, 15^{o} yaw (3) see 3 below (4) see 4 below
6.3.2	Ascent from Lunar Surface - program sequence: P00, P22, P12, P20, P34
	Initial Conditions: (1) 1σ state vector, IMU, radar errors (2) yaw LM 40^{o} after the pitch maneuver occurs; target for 1 n mi out of plane

(3) Apollo 14 O.T., Data Package

(4) normal astronaut interface from Apollo 14 Data File

6.4.0 Landing on Lunar Surface

6.4.1 Complete Automatic Landing - program sequence: P00, P63, P64, P66, P68, P00

6.4.2 Redesignations and Att-Hold-P66 Landing - program sequence: P00, P63, P64, P66 (at 700 ft), P68, P00

6.4.2.1 NOUN 69: 10K/5K ft; ACA: none

6.4.2.2 NOUN 69: 20K/20K ft; ACA: 2(+AZ), 2 (-EL)

6.4.2.3 NOUN 69: none ; ACA: 2(-AZ), 2 (+EL)

Initial Conditions: same as 6.2.0

6.4.2.2 - 10% TLOSS

6.5.0 SPECIAL TESTS

6.5.1 LM RCS Deorbit Burn-program sequence: P00, P30, P27, V96, P99, P00

6.5.2.X APS TPI Burn. - program sequence: P00, P30, P42, P00
model errors in thrust, rise time, tailoff, and mass for worse case c.g. locations.

6.5.3 Docked-DPS Burns-program sequence: P00, P30, P40, P00

6.5.3.1 CSM/LM Configuration

6.5.3.2 CM/LM Configuration